OBSTETRICS

Thromboembolism incidence and prophylaxis during vaginal delivery hospitalizations

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OBJECTIVE: Although major international guidelines recommend venous thromboembolism (VTE) prophylaxis during vaginal delivery hospitalization for women with additional risk factors, US guidelines recommend prophylaxis for a very small number of women who are at particularly high risk for an event. The purpose of this study was to characterize practice patterns of VTE prophylaxis in the United States during vaginal delivery hospitalizations and to determine VTE incidence in this population.

STUDY DESIGN: A population-level database was used to analyze VTE incidence and use of VTE prophylaxis during vaginal delivery hospitalizations in the United States between 2006 and 2012 (n = 2,673,986). We evaluated whether patients received either pharmacologic or mechanical prophylaxis. Hospital-level factors and patient characteristics were included in multivariable regression analysis that evaluated prophylaxis administration.

RESULTS: We identified 2,673,986 women who underwent vaginal delivery. Incidence of VTE increased during the study period from 15.6-29.8 events per 100,000 delivery hospitalizations. Within the cohort, 2.6% of patients (n = 68,835) received VTE prophylaxis. Pharmacologic prophylaxis was rare; <1% of women received unfractionated or low-molecular-weight heparin. Although patients with thrombophilia or a previous VTE event were likely to receive prophylaxis (60.8% and 72.8%, respectively), patients with risk factors for VTE such as obesity, smoking, and heart disease were unlikely to receive prophylaxis (rates of 5.9%, 3.3%, and 6.2%, respectively).

CONCLUSION: Our findings demonstrate that the administration of VTE prophylaxis outside a small group of women at extremely high risk for VTE is rare during vaginal delivery hospitalization. Given that VTE incidence is rising in this population, further research to determine whether broadening prophylaxis for VTE may reduce severe maternal morbidity and death is indicated.

Key words: obstetric thromboembolism, risk assessment, severe maternal morbidity

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Venous thromboembolism (VTE) is a leading cause of maternal death. A systematic review of maternal deaths that was performed by the World Health Organization implicated embolism in 14.9% of maternal deaths in developed countries[1]; the Centers for Disease Control and Prevention estimates that thrombotic pulmonary embolism accounted for 9.4% of pregnancy-related deaths from 2006-2009.[2] In the United States, strategies to reduce VTE have focused primarily on perioperative cesarean prophylaxis and prenatal risk assessment of women who are at particularly high risk for events.[3-7] Despite these efforts that included increasing use of mechanical prophylaxis during cesarean delivery,[8] obstetric thromboembolism has increased 72% during delivery hospitalizations from 1998-2009 according to data from the Nationwide Inpatient Sample.[9,10]

Recommendations for thromboprophylaxis during vaginal delivery in the United States have focused on women at the highest risk for VTE: women with acquired or hereditary thrombophilia and/or previous thromboembolic events.[4,7] VTE is twice as common after cesarean delivery compared with vaginal deliveries[9]; because more women deliver vaginally, many events occur among women who do not undergo cesarean delivery. The prevalence of risk factors for VTE is rising,[9] with obesity, advanced maternal age, and major medical comorbidities becoming increasingly common.[3,11-13] In the United Kingdom, national guidelines recommend postpartum pharmacologic prophylaxis for women with previous VTE events or thrombophilias. Additionally, these guidelines recommend prophylaxis for other common risk factors that include obesity, maternal age ≥35 years, smoking, preeclampsia,

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postpartum hemorrhage, and prolonged labor (Table 1).[14,15] In the setting of a comprehensive strategy to reduce VTE, death from this cause in the United Kingdom decreased by more than one-half, from 1.94 maternal deaths per 100,000 deliveries from 2003-2005 to 0.79 maternal deaths per 100,000 from 2006-2008.[14]

The objectives of this study were to (1) characterize contemporary practice patterns for thromboembolism prophylaxis during vaginal-delivery hospitalizations in the United States, (2) characterize the incidence of thromboembolism, and (3) to determine whether potential opportunities to reduce risk in this clinical setting are being missed.

TABLE 1
Royal College of Obstetricians and Gynaecologists recommendations for postpartum venous thromboembolism prophylaxis

Variable	Recommendation
Major risk factors	At least 7 days of postnatal prophylactic low-molecular-weight heparin is recommended if any 1 risk factor is present
Any previous venous thromboembolism[a]	
Anyone requiring antenatal low-molecular-weight heparin [a]	
Cesarean delivery in labor	
Asymptomatic thrombophilia (inherited or acquired)	
Obesity (body mass index, >40 kg/m^2)[b]	
Prolonged hospital admission	
Medical comorbidities (eg, heart or lung disease, systemic lupus erythematosus, cancer, inflammatory conditions, sickle cell disease, intravenous drug user)	
Minor risk factors	At least 7 days of postnatal prophylactic low-molecular-weight heparin is recommended if ≥2 risk factors are present
Age >35 y	
Obesity (body mass index, >30 kg/m^2)	
Parity ≥ 3	
Smoker	
Elective cesarean delivery	
Any surgical procedure in the puerperium	
Gross varicose veins[c]	
Current systemic infection	
Immobility (eg, paraplegia, symphysis pubis dysfunction with reduced mobility, long distance travel[d])	
Preeclampsia	
Midcavity rotational operative delivery	
Prolonged labor (>24 hr)	
Postpartum hemorrhage >1 L or blood transfusion	

Adapted from Royal College of Obstetricians and Gynaecologists.[15]

[a] At least 6 weeks postnatal prophylaxis required; [b] Based on earliest documented weight during prenatal care; [c] Symptomatic, above the knee or associated with phlebitis/edema, skin changes; [d] >4 hours.

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METHODS

The Perspective (Premier, Charlotte, NC) was used for the analysis. This voluntary, fee-supported database captures hospitalization data from >600 acute care hospitals in the United States. Patient demographic information, disease and procedure codes, and hospital and provider characteristics are included. The database also contains all billed services such as medications, devices, laboratory tests, and radiologic imaging. Data undergo a quality control process that includes 95 separate quality assurance and data validation checks that confirm accuracy before being used for research.[16] For each individual hospital that is included in the dataset, 100% of discharge data is included. Perspective has been used in numerous outcomes studies[17,18] that include evaluations of postsurgical thromboprophylaxis.[8,19-21] In 2006, approximately 15% of all hospitalizations within the United States (almost 5.5 million hospital discharges) were captured in Perspective.[17] All data were deidentified, and the analysis was approved by the Columbia University institutional review board.

We analyzed the cases of women who underwent vaginal delivery from 2006-2012. Patients were identified with the use of an enhanced method to capture delivery hospitalization based on *International Classification of Diseases—9th Revision* (ICD-9) billing codes V27 and 650 and diagnosis-related group codes 370-375.[22] Patients were excluded if they underwent cesarean delivery with a previously described method.[8] The primary outcome of interest was the use of any VTE prophylaxis during the delivery hospitalization. VTE prophylaxis was classified as mechanical, pharmacologic, or combination pharmacologic/mechanical. Cases that received either graduated compression